DOCUMENT RESUME

ED 244 741 PS 014 306

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TITLE Measurement-Driven Instruction as a Possible Strategy for Future Follow Through Programs. A Paper Commissioned for Follow Through Planning, Strand 1: First Wave of New Follow Through Models.
SPONS AGENCY National Inst. of Education (ED), Washington, DC.
PUB DATE 15 Jan 81
NOTE 53p.
PUB TYPE Viewpoints (120)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Classroom Environment; *Competency Based Education; *Coordination; Early Childhood Education; Educational Change; Educational Objectives; Educational Planning; Equal Education; *Program Implementation; *School Administration; Teste
IDENTIFIERS Detroit Public Schools MI; *Measurement Driven Instruction; *Project Follow Through

ABSTRACT

This document discusses measurement-driven instruction, necessary conditions for effective management, and effective program coordination in the context of the design, implementation, and coordination of future Follow Through programs. The discussion of measurement-driven instruction addresses several issues, including selection of objectives, test specifications, test items, instructional support systems, and revisions and remediation. Two measurement-driven instructional programs operated by the Detroit, Michigan, public school system are very briefly described. The section on effective management includes guidelines for promoting effective educational change and provides lists of conditions shown by research to be characteristic of effective schools and classrooms. The final section, discussing effective program coordination, provides suggestions for problem solving. First, the use of content as an integrating force is discussed. Second, school level planning is illustrated with examples from the Detroit Achievement Program, which requires each school to have an annually updated achievement plan. Third, some issues regarding equal educational opportunity are presented. An appendix includes three examples of competency-based instruction dealing with identifying main ideas, employing appropriate mechanics in writing, and problem solving in arithmetic. The examples describe the competency, provide a sample test item, describe test questions, provide guidelines for analyzing students' answers, and offer suggestions for instruction and possible teaching activities. (RH)

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MEASUREMENT-DRIVEN INSTRUCTION AS A POSSIBLE STRATEGY FOR FUTURE FOLLOW THROUGH PROGRAMS

A paper commissioned for Follow Through Planning, Strand 1: First Wave of New Follow Through Models.

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PS 014306

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Program Manual, Detroit High School Proficiency Program.
Report of the Superintendent's Committee on Achievement.

Rankin

MEASUREMENT-DRIVEN INSTRUCTION AS A POSSIBLE STRATEGY FOR FUTURE FOLLOW THROUGH PROGRAMS

Stuart C. Rankin

Measurement is a powerful educational tool that is underemployed. Its main use in education has been to serve evaluation. The use of measurement to clarify and focus instruction is certainly not a new idea, but it has been too long overlooked and used only superficially by most educators.

There are at least three reasons for giving measurement-driven instruction consideration as a possible framework for designing future Follow Through programs. The well studied and well sifted evaluations of Follow Through for the last dozen years show results which are at best mixed, so consideration of additional strategies is not without merit. Second, the techniques involved in measurement-driven instruction appear to be consistent with findings of research and theory. Third, recent experience with measurement-driven instruction has shown that in practice, it can produce achievement gains and improved instructional development.

Overview

This paper is one of a number of papers commissioned by NIE's Follow Through Research and Development Program in the hope that the nation's elementary schools can build on progress to date of Follow Through programs by adding new dimensions, frameworks, and

strategies to the end of improved learning for primary students, especially those who are educationally disadvantaged. Also, it is hoped that future Follow Through programs will provide gains which are maintained in later school and not just temporary.

The commissioned papers are grouped into three strands. The first strand seeks ideas for new models that can be implemented promptly. The second strand seeks more long-range models, and the third strand seeks supporting research. This paper was commissioned under Strand 1. The contractor was asked to address three principal topics. The first topic is measurement-driven instruction. The second topic is the management system needed in a school system to implement such a concept. The third topic is suggestions for coordinating multiple intervention programs in a school so that their several impacts might be maximized.

A description of measurement-driven instruction is presented first. Applications now operating in the Detroit Public Schools illustrate the model. A summary is given of recent research on effective schools and effective classrooms, which is applicable to the implementation of this and other programs and models if they are to be successful. Finally, suggestions for coordinating various programs in an urban school will be suggested, based on the Detroit achievement program.

MEASUREMENT-DRIVEN INSTRUCTION

The competency based educational movement and its accompanying testing programs have surfaced a number of educational issues. One such issue receiving immense national attention by citizens and educators is the degree to which instruction should be targeted at specific learnings.

Although the two extreme positions have a number of variances within them, they are sometimes described in the following manner. The terms "behaviorism" and "humanism' may assign unfair connotations to those positions and to the people who represent them, but they will be used here anyway.

The extreme behaviorist selects small measurable, teachable learnings and recommends direct practice in the specific skills or behaviors specified by the objectives. The idea is that if you cannot determine if the learning has taken place, why bother to teach it?

The extreme humanist holds that the most important learnings are not easily measured, that objectives are modified during the process of learning, that perception is individual and personal, and that measurement not only emphasizes a limited number of objectives, but may even, at times, interfere with the attainment of the objectives.

During the 1960s and the early 1970s, the development of measurable behavioral objectives led to division of the curriculum into such small targets that the objectives, in many cases, became trivial and were nonadditive. Other costs of selecting too small objectives are: (1) teachers have difficulty keeping so many objectives in mind, (2) sensible measurement standards require a fairly large number of items for each objective if we are to be sure that the objective is mastered, (3) priorities are not set, (4) the importance of organizing small objectives into larger chunks of curriculum is frequently underemphasized, and (5) no one can tell whether the larger goals of education are being attained.

At the same time, the resistance of the extreme humanist position to any kind of measurement, in a sense, implies that we cannot really tell whether learning is taking place, and, therefore, we will just have to take someone's word for it.

In order to bring the two positions together, many large scale evaluations finally settle on norm-referenced tests as a compromise among a number of programs whose objectives might be quite different. One of the many problems of using norm-referenced tests is that although they may be good for rank-ordering students, they provide little information for the improvement of instruction. Many educators are now arguing that we have screened and sorted students long enough, and it is time that we teach them. If so, a better measurement system than norm-referenced tests will be needed because the methods used to develop norm-referenced tests

render them of minimal value for instructional improvement. This paper shares in an increasing common bias that national evaluations of programs are far less important than evaluations designed and conducted locally for the purpose of improving local programs.

Fortunately, it is possible to have many of the benefits of both positions, while at the same time avoiding some of the pitfalls. The model proposed here requires: (1) that a small number of broadly based objectives be selected for a given Follow Through program, (2) that each objective be developed into a comprehensive test specification statement, (3) that each test specification statement be used for the development of a large number of test items, or other measuring tools for each objective, (4) that the instructional program be developed following the development of the test specifications, using those test specifications, (5) that some of the measurement items be used as practice items, (6) that the necessary support system be developed including instructional materials, inservice education and orientation, (7) that results of periodic measurement be used for improvement of the program, and (8) that all of the critical parties be involved in 1-7 above, so that the design has both the richness of their contributions and the commitment that comes from ownership.

Selecting the Objectives

The procedures recommended here are appropriate regardless of whether the Follow Through program design is essentially an affective model, a cognitive model, a basic skills model, or any other model. The first important task in developing a

measurement-driven Follow Through program should be the selection of objectives for learning. The best way to do this is probably to involve teachers, parents, administrators, curriculum specialists, research specialists, and Board members on a selection committee. The task is to select a small number of objectives for the whole program, or for each grade level, so that each objective is a broad area of attainment.

If there are reading objectives, the program will be better served if they are based on content groupings like details, sequence, main idea, vocabulary, cause and effect, inference, levels of reality, generalizing, and drawing conclusions. If the program chooses objectives at a lower level of abstraction, there will be too many objectives for proper measurement and it will be difficult for teachers and others to have a unified grasp of the whole program. In other words, let the breakdown of vocabulary into context clues, word structures, antonyms, synonyms and other subskills be done in the test specification for the vocabulary, rather than for these subitems as separate objectives. Under the objective of generalizing, there may be subskills of recognizing character traits, recognizing common features, identifying category labels or selecting titles for paragraphs or stories. But these subskills should be spelled out in the test specification and not be listed as separate general objectives.

On the same point, in the field of mathematics, the objectives should be limited in number. Examples might be: using numeration concepts, using geometric concepts, using whole number

concepts, using rational number concepts, applying measurement concepts, using problem-solving skills. The specific subskills--like extending a pattern of numbers through 50, or indicating time by the half hour, or distinguishing halves from fourths, or finding the perimeter of a figure--should be confronted at the stage of test specification, and these subskills should not be identified as separate objectives or competency areas.

The same rationale can be applied in the area of writing, or self-directed learning, or fine arts, or in any other program goal which may be central to a given Follow Through program.

The main point here is that there must be a small number of broadly based objectives.

When these objectives are agreed upon by the selection committee, there should be a two- or three-sentence overview statement written for each grade level. This overview statement, when presented to the selection committee, will ensure that the participants are talking about the same thing when they agree upon an objective. For example, a grade three overview statement for the mathematics objective Using Whole Number Concepts might be: "The student, presented with a problem, will be required to identify the three meanings of subtraction; demonstrate properties of addition or multiplication; add, multiply or subtract with or without regrouping; estimate a sum, product, or difference. The student will select which one of four responses is correct."

Another example of an overview statement for a grade one writing objective Using Sentence Development Skills might be: "The student

is presented with a picture and an incomplete sentence about the picture. The student will select from three words the word that best completes the sentence."

It is essential that the competency selection committee establish agreement on the learning objectives to be sought by the program. The more time spent here, the more success and commitment the program is likely to have later. Superficial or false agreement at this stage has destroyed many programs across the country. In Detroit, in the development of two separate measurement-driven instructional programs, the competency selection process took about four months for each program.

In summary, then, the first step is to use a competent and representative selection committee to choose broadly based learning objectives or competency areas small in number, and to develop for each a brief overview statement which makes the title phrase more explicit. The most valuable people at this stage will be curriculum supervisors and teachers, but agreement must be reached by the entire committee to ensure future understanding, support and commitment.

Test Specifications*

The heart of any comprehensive measurement-driven instructional program is the test specification. Too frequently, both instruction and test items are developed based on a one- or two-sentence objective statement. This condition occurs in instruction measured

*Because tests are the most common measurement device in education, we use the language of "test" development. Precisely the same approach can be used with other techniques for determining mastery of an objective.

by either norm-referenced or criterion-referenced tests. The consequences of poorly developed test specifications are: (1) lack of clarity in instructional development, (2) poorly defined domains of measurement, (3) test instruments which are not consistent with instructional programs. The solution to these problems is to take the time to develop carefully test specifications in great detail for each objective.

Test specifications are best written by measurement people after consultation with curriculum people, but they should never be accepted for use until approved by curriculum people. If too many objectives have been selected, the size of the test specification task will be prohibitive.

A good test specification presents the title of the objective or competency, the agreed-upon overview statement, a sample test item or other measurement device, descriptions of test questions or other measurement devices, analysis of answer choices or other optional responses, an example of use of the analysis of answers by applying that analysis to the sample test item, a description of key subskills which make up the objective, any special instructional considerations, and some possible teaching activities. In some cases, the test specification may also include a special vocabulary list, or a list of other experiences or problem situations which would be confronted by a student working on that objective at that grade level. The Appendix of this paper presents three illustrations of test specifications, all of which were taken from the Detroit High School Proficiency Program. The fact that

these examples are taken from the high school level may, to some extent, lessen their value as illustrations for a Follow Through program. However, the tasks are identical and only the content would vary. Examination of these model test specifications will indicate that they frequently run five or six pages in length, and give a comprehensive treatment of the objectives. In addition, they show the boundaries of the objective so that teachers and test item writers can determine both what is inside that objective and what is outside of it.

The process of writing test specifications will probably consume several months. The task can be done by a large school system with limited outside help, but both small and large districts might profit from using an outside contractor at this stage. In Detroit, high school programs were developed with considerable help under contracts with the Instructional Objectives Exchange. At present, the development of programs for reading, writing and mathematics for grades 1-8 is proceeding in-house.

Test Items

When the test specifications are in place, the program development process branches. The measurement specialists create a large number of test items for each broad objective. At the same time, the instructional specialists develop the instructional support system. Test item development is discussed here first because the test items are needed for the support system.

The measures need not always be test items. The traditional concept of a test may be inappropriate for certain objectives such

as: "the ability to work with others," "skill in generating unique responses," or "taking responsibility for one's actions." The essence of measurement-driven instruction is that agreement is made in advance of instruction on what evidence should be accepted that the learning has occurred. The point here is not that learning must be measured by tests, but rather that careful attention in advance to the indicators of learning, regardless of the form, will enhance the effectiveness of instruction. But tests are the most common indicators and the best understood, so we speak here of test items.

A large number of test items is needed for each objective because these measures are used for diagnosis, for instruction, and for determining mastery. The items are most easily produced by experienced test item writers, but teachers and others can be trained to write items and then have them reviewed by measurement specialists. The most critical feature of a test item is that it meet the test specification fully.

As Popham and Millman have pointed out, the number of items per objective on a test is important to the confidence that educators can place in the test results. If the consequences of either claiming mastery where it doesn't exist or claiming its absence where it does, are severe, such as grade promotion or failure, then using eight or more items for each objective may be necessary. If the test purpose is diagnostic, then fewer will do.

If the level of sophistication of measurement requires equivalent test forms, then consideration should be given to using the Rasch model for determining difficulty levels. In any event, test

items should meet several standards. They must fit the test specifications. They should be acceptable to curriculum specialists. They should be appropriate for the age of the students. They must be screened for sex and race bias. And, because they are instructional devices, they should be able to hold student interest.

Instructional Support System

A key concept of measurement-driven instruction is focused instruction. Those learning activities that are only indirectly related to the specific skill being sought are much less likely to be cost-effective in producing mastery of the objective than activities that are targeted directly at the behaviors required by the objective.

The mastery learning model developed by Bloom, Block and others is very compatible with measurement-driven instruction, largely because of the heavy emphasis on precise measurement of progress.

Teachers' effectiveness in using this approach can be enhanced if four general principles guide their efforts. First, teachers should have a clear comprehension of the competencies being sought, their subskills, and acceptable evidence of their mastery. Second, the nature of the competency and the reason why it should be learned must be communicated early and often to students. Third, students should have ample opportunities to practice the skills required by any objective. Fourth, student progress should be frequently monitored so that those students needing help get it. How much learning time has been misused or wasted because of lack of careful checking on student progress!

The instructional support must provide orientation for students and parents and training for staff. Competency descriptions including test specifications, practice test items, the concept of focused instruction, suggestions for instruction, special vocabulary, special materials, supervisors and other lead staff are all parts of the needed support structure.

Revisions and Remediation

Measurement-driven instruction, like any instructional strategy, requires adjustments over time. School districts using this approach will likely find that more students master all of the objectives more quickly as the semesters go by. But competencies will vary in difficulty. Experience will lead to the elimination of some objectives as too easy. Others may require redefinition and more time. Some may have been placed at the wrong grade level.

In Follow Through programs, many reading specialists will want to omit decoding skills from testing on the argument that decoding is only important when it results in comprehension, so why not just measure comprehension. Teachers, however, will likely insist that since they spend a lot of time teaching decoding, therefore, it should be measured. Under such circumstances, it may be wise to go along with the teachers at least initially.

Results need to be monitored at the classroom, school, and district levels as well as for individual students. A standing committee should regularly review progress, listen to teachers, modify objectives, suggest new instructional strategies, create new measures, and design in-service education events as needed.

Analysis of individual student results on tests will lead to greater understanding of subskills, and in turn to the development of new instructional strategies as needed. Regular feedback to students will provide frequent, earned, and specific reinforcement of learning successes. Such feedback will also ensure prompt remediation so that where learning is sequential and strongly dependent on earlier learnings, appropriate readiness will be achieved by larger than usual numbers of students.

Application Examples

The Detroit Public Schools system currently operates two measurement-driven instruction programs, both at the secondary school level. The Ninth Grade Communication Skills Program (NORT) is in its third year of operation and the High School Proficiency Program* (HSPP) is in its second year.

Both programs have followed the development processes and principles described in this paper. In each case, Detroit reviewed competitive bids to select a test development contractor to help with (but not to control) the establishment of the programs. The Instructional Objectives Exchange (IOX) was the successful bidder in both cases.

The NORT has only nine competencies (objectives): four reading, three writing, and two study skills. The HSPP provides students an opportunity to have their diplomas include an endorsement of mastery of fundamental skills; it has four reading, four writing and four mathematics competencies.

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*The Detroit HSPP Program Manual is an attachment to this report.

Both programs have led to much improved understanding of these skills and how to teach them on the part of English, mathematics and social science teachers. Increased student learning has provided evidence to staff that students can learn better and teachers can teach better. The skill of paragraph development is tested with a writing prompt and the requirement that students actually write a proper paragraph. The responses are scored by a team of readers, and many excellent teaching techniques have come out of this process and been fed back into classrooms.

Results from both programs show substantial growth within school years under targeted instruction and increased numbers of students demonstrating mastery each succeeding year. When nearly all students are showing mastery of these skills, consideration will be given to extending measurement-driven instruction to other skills, other subjects, and other grade levels.

Variance between competencies may some day result in the elimination of one or two of the competencies required for graduation as too easy. Analysis of the more difficult skills has led to the development of new, targeted learning activities.

There is nothing in either of these applications that suggests that their promise and their early success are unique to the high school. Use of measurement-driven instruction principles for Follow Through programs should be considered seriously.

NECESSARY CONDITIONS FOR EFFECTIVE MANAGEMENT

Management practices which will help ensure success for major programs in major school districts are peculiar neither to Follow Through programs nor to measurement-driven instruction. They are necessary conditions for any successful program.

Such guides to effective management are best found in the research on effective schools and effective classrooms which is quite recent and in the research on the change process which is quite old and pervades other social endeavors as well as education.

Specific management techniques are not needed. What successful program implementation requires is that the fundamental findings of research on effective schools and effective change be used.

Effective Schools and Effective Classrooms

Ten years ago, urban educators could claim with some justification that we really don't know how to teach urban students effectively. That condition is no longer the case. A wealth of recent research has identified characteristics common to effective schools and to effective classrooms. In nearly every case, the research has used achievement in the fundamental skills as the criterion for success.

School systems interested in putting in place effective management practices to ensure success of Follow Through and other educational programs can benefit from this recent research. Energies expended in establishing these characteristics would probably be the most cost-effective efforts that a school district could conduct. We do not yet have proof that these characteristics are causal or even that taken together they provide sufficient conditions for improvement. However, the evidence is accumulating rapidly that these characteristics are present in effective schools and may be necessary conditions for improvement.

The findings are organized into those which are best seen as characteristics of the entire school and those which are best seen as characteristics of classrooms. In each case, a list is included of some of the individual researchers who might be helpful to school districts designing Follow Through programs.

School Characteristics--

- Strong instructional leadership is provided by principal. The principal is recognized by staff and community as instructional leader, shows confidence in staff, articulates priorities clearly, monitors student progress, makes decisions and confronts problems of whatever nature. Some researchers who are knowledgeable in this area are: Brookover, Chase, Clark, Edmonds, Madden, Rankin, Rutter, Weber.

° Schoolwide emphasis is placed on basic skills. Some researchers are: Brookover, Edmonds, Lezotte, Rutter.

° School objectives are clearly defined in communicating. Staff participates in defining objectives and those objectives are known by staff, students and parents. Researchers include Brookover, Clark, Edmonds, Wynne.

° Teachers have high expectations for their own impact. They believe that they can make a substantial difference in student learning and they accept responsibility for teaching and learning. Researchers are: Aspy, Brookover, Benjamin, Edmonds, Lezotte.

° Student progress is carefully monitored. There is frequent use of diagnostic and progress tests. Researchers include Bloom, Brookover, Edmonds, Weber.

° Parents behave in the home in a manner supportive of education. Schools have some ability to influence this characteristic. The behaviors which seem to matter are a press for achievement, space and help for homework, good verbal communication models, emphasis on work habits, and parent communication with child regarding school progress. Researchers are: Bloom, Brookover, Clark, Dave.

° A positive academic learning climate pervades the whole school operation. The school is a social system which operates as a coherent whole sharing attitudes, beliefs

and expectations. This attitude is seen in the way students are treated both individually and as groups. The school is an orderly and business-like place. It is quiet without being oppressive; the emphasis is clearly on learning; attention is given to physical condition of the school plant; it may or may not be a happy, jolly place but it is certainly not unhappy or oppressive. Researchers include Brookover, Lezotte, Rutter, Benjamin, Edmonds, Weber.

Classroom Characteristics--

- Teachers communicate high expectations to students. Teachers must not only believe that all students can learn, but must convey that belief to the students, not just by saying it but by the way they deal with student responses throughout the teaching day. Researchers are: Brookover, Edmonds, Weber, Stallings.
- Objectives and tasks are made clear to students. Students must know not only what is expected of them, but why it is important. Researchers are: Bloom, Brookover, Edmonds, Evertson, Hunter, Popham, Rosenshine.
- Students receive frequent feedback of progress. Success does not occur at the end of a semester or card marking period, but many times each day. Students should be kept informed of their progress and receive frequent positive feedback. There should be clear differentiation

between right and wrong answers. Students are not helped when teachers make the same comment to both right and wrong answers. Researchers are: Berliner, Bloom, Brookover, Edmonds, Kerman, Medley, Rutter, Stallings, Weber.

° Engaged time-on-learning tasks is high. More time is allocated for academic instruction; less time is lost in nonproductive activity; and a high percentage of learning time finds students actively thinking and engaged in the learning task. Researchers are: Berliner, Brophy, Harnischfeger, Rosenshine, Rutter.

° Classroom instruction is structured. Research on effective classrooms recently has favored the structured classroom over the less structured one. There is frequent large group instruction and less emphasis on individualization. The instruction is largely teacher-directed and systematic in nature. Students perform at a high success level most of the time. Researchers are: Berliner, Bloom, Brophy, Block, Clark, Edmonds, Hunter, Madden, Medley, Rosenshine, Rutter, Stallings.

° Little differentiation of instruction among students is provided. This finding is powerful and contradicts much common practice of education. The effective classrooms assign questions in a more random fashion. No students are limited to only easy or only hard questions. Appropriate use of rephrasing and classifying questions occur

for all students with ample time provided for a response. There is far less ability grouping. If grouping is necessary, it is more likely to be heterogeneous. Researchers are: Bloom, Kerman, Rutter, Stallings.

- The classroom is orderly and management is routine. Discipline is strict but not punitive or overbearing. Business-like procedures are expected and enforced. Researchers are: Benjamin, Brophy, Cawelti, Evertson, Medley, Stallings.

The Change Process

One important principle in educational change is that the single school is the largest unit of change. If more school districts would recognize that reality, more programs would succeed. The underlying reason is probably linked to the concept of ownership.

No educational program is likely to succeed unless the staff members at the school believe that the program can work for them. Such a belief comes from ownership. If the program is designed by the staff, ownership is a by-product of the design process. But, most major programs are designed by others. Therefore, specific plans and actions are required in the orientation and training of staff in any new program. Ideally, the staff will choose to participate. If not, ownership may be achieved by encouraging some school level adaptations and modifications of the new program. Otherwise, all the chips ride on effective orientation and training.

Sometimes, an inside-outside team can be effective. The inside might be the school and the outside the district. More often, the outside is a research center or model sponsor and the inside has both school level and district level staff. Inside-only teams tend to design programs that make only trivial or at best small incremental changes. Outside-only teams tend to provide answers to questions that insiders don't have--or their efforts are rejected when the classroom door closes because of lack of ownership or lack of belief by the teachers that the outsiders understand the problems. For these reasons, there is merit in the inside-outside design team. Good management would foster it.

Tasks that are not assigned, often fall between the cracks. The expected success of the Detroit High School Proficiency Program, a classic example of measurement-driven instruction, will be due more to the effectiveness of the Implementation Committee than to any other variable. Budgets, training, orientation, identification of decisions, public relations, trouble shooting, schedules, legal considerations, analysis of results, formulations of recommendations for change are all considerations of this crucial committee. It has school, region, and central level staff. It has evaluation specialists, curriculum specialists, staff development specialists, principals, special education and bilingual specialists, and curriculum generalists. It was appointed and charged by the General Superintendent. It ensures that things are done on time, decisions get made, recommendations get attention. The establishment of an implementation committee, properly charged, will go far to see that proper management occurs for a Follow Through program.

Commitment from the top is necessary for success. Proposers of new programs can never guarantee success, but failure is assured without commitment by the Superintendent and the Board. No program proposal should go to either without a budget attached. If the district will make no financial commitment, then there is no commitment. Also, requiring some district commitment of funds will ensure that proper attention in depth is given to the program plan by the Superintendent and the Board of Education.

Finally, responsibility for program operation must be assigned to an individual with sufficient skill, commitment, and rank to provide effective leadership and to get a hearing whenever trouble attends the program.

EFFECTIVE PROGRAM COORDINATION

Since the middle 1960s, many school districts have operated a large number of specially funded projects under the auspices of Title I of the Elementary and Secondary Education Act of 1965 and under many other state and federal programs. In some cases, these programs have become the tail that wags the dog, in that they have received more attention than the regular school program.

Sometimes, special projects have operated almost like a second school system which has its own employees, which competes with the regular program for able staff, and which generates its own community constituency. In other cases, the special projects are not seen as a single effort but as a number of competing programs so that there may in fact be five or ten different operations in the same school. The guidelines and regulations for such special projects often place constraints on the way the funds are used and inhibit proper coordination of the efforts.

Generally, the focus of special federal and state funded projects has been on process rather than content. Most programs are sending dollars after method rather than after specific learnings.

These problems of coordinating or integrating services for children have hampered the effectiveness of Follow Through programs along with other categorical programs. In this section, suggestions

are made which may help solve the coordination problems. First, the use of content as an integrating force is discussed. Second, school level planning is illustrated with the Detroit achievement program. Third, some issues regarding equal educational opportunity are presented. Taken together, these strategies may result in increasing the impact of separate programs, including Follow Through.

Content as Integrator

Our most successful principals in urban school systems are those who have found the secret to taking the best out of every program available to them and focusing diverse resources on clearly defined learnings. The successful principal is not found complaining when one more program is added that has to be operated, but rather looks at that program for how it can help him/her and the staff to achieve the instructional goals of that school.

The integrating idea must be something that is found in all programs if those programs are to be coordinated properly and the resources are to help with the instructional task. It appears that the best integrator is the content itself. What this means for school staff members, and even district-level curriculum specialists, is that the school and school district should define the content to be learned carefully, and that special projects should be seen primarily as processes or methods for delivering that content.

It must be clear at this point that the bias of this paper is that content will be best defined in terms of broad objectives for which full test specifications are written and for which measures of mastery are in place along with, or prior to, the instructional design.

Schools that use content as the integrator will find that many of the problems associated with competing projects and programs are lessened when those programs are seen as processes in a supportive role for helping to deliver the content.

School Level Planning and the Detroit Achievement Program

In the early 1970s, the Superintendent of the Detroit Public Schools charged a task force with developing a program to improve achievement in all Detroit schools. After a year's study and design, that group produced the Report of the Superintendent's Committee on Achievement, which is attached to this report. The essence of the Detroit achievement program is found in Chapters 3 and 4 of that volume and centers on individual school planning as the primary instructional strategy.

In the Detroit achievement program, each school is required to have an achievement plan which is updated annually. Every school plan specifies the goals and objectives, problems and resources, learning experiences which are likely to produce the objectives, a strategy for delivering those learning experiences, and a design for evaluating the achievement results and the effectiveness of the various processes used in achieving those results.

The school achievement committee includes the principal, a number of staff members, and community representatives. At the middle and high school levels, the committee also includes students.

The Detroit achievement program is now in its seventh year and has become institutionalized. In the elementary and middle

schools it is quite effective, although it has been less effective at the high school level. Each year, every school develops its achievement plan and submits it to the region office for approval and support. Staff members at elementary and middle schools have become quite sophisticated in achievement planning. These plans are used as integrating forces among a multitude of school programs. The school achievement plan is the central fiber which holds together the cloth of all other programs, especially federally funded projects. Schools using such a planning strategy effectively have less difficulty in carrying on a diverse set of programs, because each program is seen as a servant to the fundamental achievement plan.

Fortunately, the achievement results in the Detroit schools ceased their 15-year decline in the early 1970s, and they have begun to rise since then, slowly but steadily. It is the belief in Detroit that these increases are partly the result of the effectiveness of the achievement program and its usefulness in coordinating a large number of special projects.

In order to see that the program is sustained, the school district has each year committed resources to the program so that some monies are available to help school staff have time and other resources for planning. The program also provides an achievement specialist and secretarial help at each of the eight Detroit regions, and a central achievement coordinator who works in the Planning Department of the Office of Research, Planning and Evaluation.

Early suspicions by teachers that the program was an accountability plan and by principals that it would result in more work have now been laid to rest. The program is fully accepted; it is generally nonthreatening; and it has been especially effective in coordinating what otherwise might be competing programs. It would seem that a similar strategy might be helpful in seeing that Follow Through programs have their maximum impact.

Equal Educational Opportunity Issues

The parade of federal intervention programs over the last 20 years has been led by the banner of equal educational opportunity. More careful attention to the several possible meanings of equal educational opportunity can be instructive to those interested in delivering compensatory and other services to children who are not learning well enough.

In the early days, equal educational opportunity, sometimes now called educational equity, was based on the principle of access. If some students were segregated in inferior schools, then they did not have access to equal opportunity. Separate facilities were defined by the courts as inherently unequal. Many persons argued that equal educational opportunity would result from equal access to schools. These forces supported the desegregation efforts and efforts to open up access to school and college programs to all students.

A second standard for educational equity was the participation standard. Individuals argued that equal access was not enough, but that students had to be treated equally within programs and that

grouping techniques within schools had to be carefully controlled so that equal participation would be achieved for all students. Placement of students in special education and other programs, suspension practices and involvement in extracurricular activities all were studied as part of the participation standard.

Now comes a third standard for equal educational opportunity --the outcomes standard. Advocates of this standard argue that equity is attained when, and only when, the distributions of attainments are equivalent for students of different races, different sexes, and different socio-economic standards. This is not to say that there would be no range of attainment within each of these groups, but that the mean and variance would be the same for boys as for girls, for blacks as for whites, for poor as for middle class.

The equal access and equal participation standards can tolerate variances in outcomes, because the test of their effectiveness is on the input side. Advocates argue that people will always be different and that equal opportunity simply means providing them all the same chance, and that one does that when one provides equal access to programs and full participation within them. Those advocates would say that once that is done, let the chips fall where they may.

The advocates of the outcomes standard would argue that there is a certain level of achievement of skills, knowledges, understandings, beliefs that should be guaranteed to all children and youth--that delivery of those competencies is a necessary condition for equal educational opportunity. Those advocates would not want to

limit achievements that might go far beyond those guaranteed learnings for whomever can go far beyond. But they would insist that equal opportunity must go beyond input to the outcomes of education.

It is this third standard which fits so well with measurement-driven instruction, mastery learning, the belief that all children can learn, the refusal to make excuses for disadvantaged students, and the motivation that increasing numbers of urban educators accept for their belief that the children of the poor need not perpetuate low levels of education and future generations of poverty.

1. IDENTIFYING MAIN IDEAS

Competency Description

OVERVIEW

After reading a selection from a news story, a magazine, or a general information publication, the student is to identify its main idea by choosing from four statements the one which most accurately and comprehensively presents the central point of that selection.

SAMPLE TEST ITEM

Directions: Read the selections in the boxes below. Select the best main idea statement for each selection.

From a daily newspaper . . .

DISCO FOES

Older residents are working at a fevered pitch to prevent a discotheque for teenagers from opening in a Michigan community. The discotheque's owners have already obtained a permit to build. However, local protesters continue to petition the city council to prevent the opening of the disco doors.

If the owners succeed, the disco will be open between 7 p.m. and 1 a.m. five nights a week. One resident complained that those hours would disturb local people who count on a good night's sleep.

Even though no alcohol would be served, the protesters feel the disco will bring more crime to the area.

"Our neighborhoods won't be safe for our families," resident John Mann complained. He pointed out that the area already suffers from teenage alcoholism and drug abuse. He said the presence of the disco would increase the area's problems.

1. Which one of the following is the best statement of the main idea of this selection?

   A. Discotheques are responsible for increasing drug and alcohol problems among teenagers.

   B. Older citizens should not spend all of their time protesting teenage activities.

   C. A proposed Michigan disco would be open between 7 p.m and 1 a.m. five nights a week.

   D. Residents in a Michigan community think that a discotheque will be harmful to their community.

DESCRIPTION OF TEST QUESTIONS

1. A selection will be 125-200 words long. It will be based upon material that has actually appeared in a newspaper, magazine, general information book (or pamphlet), or consumer guide.

2. A selection will communicate one central idea. This central idea may be stated explicitly in the selection, or it may need to be inferred from the selection.

3. A selection will be followed by the question: "Which one of the following is the best statement of the main idea of this selection?"

ANALYSIS OF ANSWER CHOICES

1. Four statements of possible main ideas will follow each reading selection. These statements will be either a sentence taken directly from the reading selection or a sentence plausibly related to the selection.

2. The correct answer will be a main idea statement that is both <u>accurate</u> and of the <u>appropriate</u> <u>scope</u>:

   a. A statement that is <u>accurate</u> contains only information that can be verified in the selection.

b. A statement that is of the appropriate scope encompasses all of the most important details contained in the selection.

3. The incorrect answers will be main idea statements that are either inaccurate, inappropriate in scope, or both:

   a. A statement is inaccurate if it is:

      (1) Contradicted by information in the reading selection. Something stated in the selection makes this answer choice untrue.

      (2) Unsupported by information in the reading selection. There is no information in the selection that can be used to determine whether this answer choice is true or not.

      (3) A statement of opinion or a value judgment. Such a statement, because it is not factual, can never be proven true or false.

   b. A statement is inappropriate in scope if it is:

      (1) Too narrow in scope. It is not comprehensive enough to account for all of the important details contained in the selection.

      (2) Too broad in scope. It is more general than is needed to account for all of the important details contained in the selection.

4. The three incorrect answers for a selection will include at least one statement that lacks accuracy and one that lacks appropriate scope.

ANALYSIS OF SAMPLE TEST ITEM

A. Inaccurate--unsupported by the selection.
B. Inaccurate--a statement of opinion.
C. Inappropriate in scope--too narrow.
D. Correct answer.

Instructional Suggestions

KEY SUBSKILLS

Identification of Major Points. Students must be able to identify the important details in a reading selection. These details will be those which are placed in a position of emphasis such as the beginning or end of the selection and those which are repeated or elaborated upon in the selection.

Determination of Accuracy. Students need to be able to determine whether or not a reading selection contains evidence related to a main idea statement and, if it does, whether that evidence supports or contradicts the statement itself.

Determination of Appropriate Scope. Students need to be able to recognize the difference between a statement that is general enough to incorporate all of the most important details in a reading selection, a statement that leaves out some of the selection's important details, and a statement that overgeneralizes about those details.

INSTRUCTIONAL CONSIDERATIONS

Students must become able to identify a correct main idea statement, both when it needs to be inferred from a reading selection and when it is actually stated in a reading selection. In order to master this skill, students must be able to apply the concepts of accuracy and appropriate scope. Students' ability to determine the main idea of a selection will depend on the extent to which these two concepts have been effectively described and sufficient practice in applying them, first separately and then in combination, has been supplied.

POSSIBLE TEACHING ACTIVITIES

Original Main Idea Statements. Either read aloud or distribute copies of selections of the types described in the DESCRIPTION OF TEST QUESTIONS section of the competency description. Ask students to write out a statement of each selection's main idea. Have students exchange their work with each other, then critique each main idea statement on the basis of accuracy and appropriate scope. Particularly good main idea statements can be read aloud and discussed by the whole class.

Copy Editor. Ask students to select a newspaper article and then create a main idea statement about that article which incorporates both accuracy and appropriate scope. Have other students read the article and judge whether the main idea statement is satisfactory. If a statement is deemed unsatisfactory, the reviewers should write revised versions.

Listening for Main Ideas. Read some passages aloud to the class and have students write down and then share with each other statements that they think reflect the main idea of each one. Apply the criteria of accuracy and appropriate scope in judging student efforts.

Telegraph Time. Have students read selections comparable to those found on the test. Then ask them to create a telegraph message of no more than 10 words to capture the main idea of each selection. These telegraph messages can be shared and discussed. As a demanding variation, play "Telegraph in Half," which requires students to state the main idea of a passage in five words or less.

Rights and Wrongs. Have students complete one set of Main Idea practice exercises. After they have selected the correct answer for each item, have them label each incorrect answer according to whether it is inaccurate, inappropriate in scope, or both. Discuss the results.

1. EMPLOYING APPROPRIATE MECHANICS IN WRITING

Competency Description

OVERVIEW

The student is presented with an excerpt from a written communication. Three single corrections, one each in spelling, capitalization, and punctuation, are suggested. The student indicates whether one of these changes needs to be made, or whether the excerpt is already correct.

SAMPLE TEST ITEM

Directions: Check the selections in the boxes below for correct spelling, capitalization, and punctuation. For each selection indicate which correction, if any, needs to be made.

(1) Anita Flores
(2) 2994 Big Beaver Road
(3) Troy Michigan 48084
(4) February 17, 1979

(5) Mr. Gary Johnson
(6) Mainline Gas Company
(7) 3552 Plymouth Road
(8) Ann Arbor, Michigan 48105

(9) Dear Mr. Johnson:

1. Which one, if any, of the following corrections is needed above?
   A. Line 2: Change the capital letter R to a small letter in Road.
   B. Line 3: Add a comma after Troy.
   C. Line 4: Change the spelling of February.
   D. No corrections are needed.

DESCRIPTION OF TEST QUESTIONS

1. A test question will consist of an excerpt from a written communication that might have been composed by a young adult. Such communications will include:

   a. business letters
   b. personal letters
   c. sets of directions
   d. descriptions or explanations such as might be required on accident reports, insurance claims, or application forms.

2. An excerpt may contain a single error in spelling, capitalization, or punctuation, or it may contain no errors. All errors will be based on the Spelling List Supplement and the Mechanics Supplement presented at the close of this competency's instructional suggestions. The types of errors eligible are as follows:

   a. Spelling
      (1) Misspelling a word.

   b. Capitalization
      (1) Failing to capitalize a word that should be capitalized.
      (2) Capitalizing a word that should not be capitalized.

   c. Punctuation
      (1) Omitting a necessary punctuation mark.
      (2) Inserting an unneeded punctuation mark.
      (3) Using an incorrect punctuation mark at a place where a punctuation mark is needed.

ANALYSIS OF ANSWER CHOICES

1. Only capitalization rules, punctuation rules, and spelling words listed in the supplements may form the basis for answer choices.

2. The correct answer will be either:

   a. An identification of the change needed to correct the error present in an excerpt.

   b. An indication that no correction is needed when the excerpt is entirely correct.

3. The incorrect answers will be either:

   a. An indication that the excerpt needs no changes when there is an error in it.

   b. Indications of the wrong changes to make when there is an error in the excerpt.

   c. Indications of any change when the excerpt is in fact correct.

ANALYSIS OF SAMPLE TEST ITEM

A. Incorrect--names of geographical locations are capitalized.
B. Correct answer--a comma is needed between the independent parts of an address.
C. Incorrect--the word is spelled correctly.
D. Incorrect--the excerpt needs a correction.

Instructional Suggestions

KEY SUBSKILLS

Ability to Spell Correctly. Students must know the correct spellings of the words on the Spelling List Supplement given at the close of this competency's instructional suggestions.

Ability to Punctuate Correctly. Students must be able to identify all instances where a punctuation mark listed in the Mechanics Supplement is required.

Ability to Capitalize Correctly. Students must know when a word should or should not be capitalized, according to the Mechanics Supplement.

INSTRUCTIONAL CONSIDERATIONS

This competency assesses students' abilities to detect errors in spelling, capitalization, and punctuation. As a result, a great deal of substantive content is involved. The competency's spelling and mechanics supplements describe the content for which students will be held accountable. Teachers will have to promote students' mastery of each of (a) the 470 spelling words, (b) the 24 capitalization rules, and (c) the 19 punctuation rules. Students must be given plenty of practice opportunities to apply their knowledge of the rules and spelling words in varied settings, including test situations similiar to those employed in measuring this competency.

POSSIBLE TEACHING ACTIVITIES

Pair Fare. Have students work in pairs, creating unpunctuated sentences, then writing each sentence with the correct capitalization and punctuation. The initial unpunctuated and uncapitalized sentences are given to another pair of students who must attempt to correct them. Comparisons are then made between one pair's "correct" sentences and the other pair's attempts to punctuate and capitalize those sentences.

Chalk Talk. Put unpunctuated and uncapitalized sentences on the chalkboard and then ask the class to indicate how the sentences should be altered to become properly capitalized and punctuated. This activity could be completed individually, or by groups of students competing against each other in a "punctuation bee."

Spelling Bee. Divide the class into two groups of roughly equal ability, then conduct a traditional spelling bee where the best spellers remain in the game until the end. As a variation, keep everyone in the game, but award points to the other team whenever someone misspells a word. Words should be drawn from the Spelling List Supplement. A similar team game could be organized using problems based on the Mechanics Supplement.

Team Trickery. Split the class into four or five teams. Have each team write a given number of sentences (five, for instance), which are properly spelled, capitalized, and punctuated. Then ask each team to modify some or all of its sentences so that they contain errors. All errors must be based on the spelling or mechanics supplement. Copies of the modified sentences are distributed to the other teams, and copies of the original correct sentences are given to the teacher. Teams correct each other's sentences. Points are awarded for each error corrected and deducted for each erroneous "correction." This could be an ongoing activity with running team scores kept over a period of several weeks.

Blooper Scrapbook. Over the period of a term or a year, students can collect instances of spelling, punctuation, and capitalization errors they find in published materials. These examples can be either copied or cut out from such sources as newspapers and magazines and compiled into a Blooper Scrapbook. If the school has a student newspaper, this is often a rich source of potential mistakes. Each entry in the scrapbook might be followed by a note explaining the correction needed to rectify the mistake.

MECHANICS SUPPLEMENT

Capitalization Rules Eligible for Testing

A capital letter is needed in the following situations:

1. The first word of a sentence
2. All the words in a title, except internal prepositions, articles, and conjunctions
3. The first word in a letter's salutation
4. The first word in a letter's complimentary close
5. Names of days of the week
6. Names of months of the year
7. Names, including initials, of individuals
8. The pronoun I
9. Titles which precede individuals' names, including abbreviations for social titles (e.g., Mrs., Mrs.) and words denoting family relationships (e.g., Aunt Lucy)
10. All the words in the names of holidays except internal prepositions and articles
11. All the words in the names of specific geographical locations or entities except internal prepositions and articles (e.g., The Avenue of the Americas)
12. All the words in the names of specific organizations, except internal prepositions and articles
13. Names of languages
14. Names of races
15. Name of nationalities
16. Names of religions
17. Adjectives formed from names of geographical locations, languages, races, nationalities and religions

Note: All examples selected to test rules #9-17 will be ones that are either likely to be within the common knowledge of Detroit students or self-evident from their context as to their nature.

A capital letter is never used in the following situations:

18. Common nouns

19. Names of seasons

20. Family relationship names which are preceded by a possessive noun or pronoun (e.g., my mother)

21. Family relationship names which do not stand for a particular person (e.g., Do you have a brother?)

22. Adjectives not based on proper nouns

23. Common nouns used to define or refer to proper nouns (e.g., the state of Michigan)

24. Common nouns modified by proper adjectives (e.g., Michigan automobiles)

Punctuation Rules

The specified mark is needed in the following situations:

Period

1. At the end of all sentences except direct questions and exclamations

2. After abbreviations

Question Mark

1. At the end of a direct question

Comma

1. In a series of three or more words or phrases (a comma preceding the "and" prior to the last item in the series being optional)

2. After the complimentary close in a letter

3. After the salutation in an informal letter

4. Between independent clauses joined by a coordinate conjunction (i.e., and, but, or, nor, for, yet, so)

5. Between the independent parts of a date (e.g., Tuesday, May 7; May, 1980; May 7, 1980) and at the end of a multipart date that occurs within a sentence (e.g., The meeting will be held on Tuesday, May 7, 1980, in Newtown.)

6. Between the independent parts of an address or geographical name, except between the name of a state and its zip code (e.g., 1650 Smith Road, Ann Arbor, Michigan 48105) and at the end of a multipart address or geographical name that occurs within a sentence (e.g., Yesterday I mailed the package to Seattle, Washington, hoping it would arrive before next week.)

7. After a last name, when the order of an individual's name is inverted (e.g., Smith, Harry)

Semi-Colon

1. Between independent clauses not joined by a coordinate conjunction

Apostrophe

1. To form possessive nouns

2. To form contractions

Colon

1. After the salutation in a business letter

2. To introduce a list of items

3. To separate hours and minutes in time

Quotation Marks

1. Around direct quotations

Hyphen

1. For syllabication at the end of a line

Underlining

1. To indicate titles of books, magazines, and newspapers

1. PROBLEM SOLVING: SINGLE ARITHMETIC OPERATIONS

Competency Description

OVERVIEW

The student is presented with a problem situation that a young adult might encounter while carrying out personal finances, acting as a consumer, managing a household, or traveling. A problem will require the use of a single arithmetic calculation of addition, subtraction, multiplication, or division. After working a problem, the student indicates which one of four numerical responses is the correct solution.

SAMPLE TEST ITEM

Directions:

1. Solve the following problems using the scratch paper you have been given.
2. Reduce all fractions to their lowest terms.
3. Round off all monetary amounts to the nearest cent.
4. Round off decimals as directed.
5. The correct answer appears among the answers you are given. Darken the circle that goes with the answer you choose.

CEDAR POINT

SPECIAL ADMISSION RATES!
Single Ticket: $8.75

Group Rates (10 or more): $7.50 per person

1. Twenty-seven members of your class are going to Cedar Point on Saturday. How much will the group pay for admission?

   A. $189.50

   B. $270.00

   C. $202.50

   D. $236.25

DESCRIPTION OF TEST QUESTIONS

1. A test question will be based on a situation a young adult might commonly encounter when engaging in one of the following activities:

   a. Personal Finances

      (1) Calculating one's own wages
      (2) Budgeting income and expenses
      (3) Balancing a checkbook
      (4) Completing a short form income tax return
      (5) Paying monthly bills
      (6) Calculating banking deposits and withdrawals

   b. Consumer Finances

      (1) Making installment payments
      (2) Computing price-per-unit costs
      (3) Totaling receipts or bills
      (4) Calculating change due on a purchase

   c. Travel

      (1) Figuring travel expenses
      (2) Computing gasoline mileage
      (3) Determining elapsed or future travel time
      (4) Figuring distances traveled

   d. Home Management

      (1) Adapting recipes
      (2) Computing caloric or nutritive values for food
      (3) Determining air or cooking temperatures
      (4) Preparing liquid solutions
      (5) Determining cooking times
      (6) Determining mailing charges

2. A test question will require a single mathematical calculation for the determination of its answer and will contain sufficient information for that calculation. The calculation may be addition,

subtraction, multiplication, or division. A question will not require the application of a mathematical formula.

3. Display materials used in test questions will include:

paychecks	budgets
lists	checking account registers
bank statements	income tax forms
credit card statements	utility bills
receipts for purchases	recipes
food value charts	instructions from household products

4. The limits applying to numbers used in problems are as follows:

   a. Only integers, fractions, decimals, mixed numbers, and percents will be used.

   b. Integers may range from -50 to 5,000. Negative integers can be used in items related to air temperatures.

   c. Denominators of fractions may range from 2 to 12.

   d. Decimals will be used only to express monetary amounts and nutritive values of foods. Monetary amounts may range from $ .01 to $10,000. Amounts less than one dollar may be written with either a $ sign or a ¢ sign. Decimals in the form of tenths (e.g., 1.3 or 2.9) can be used in problems where they would be likely to occur in real life, for instance, tenths of gallons or tenths of miles.

5. A question may require the student to reduce a common fraction to its lowest terms or to round off a decimal fraction or monetary amount.

6. A question will not require a conversion to be made from the U.S. Customary system to the SI metric system, or vice versa.

ANALYSIS OF ANSWER CHOICES

1. The correct answer for a test item will be the numerical response arrived at when the problem is correctly translated into an arithmetic expression and the necessary computation is accurately performed.

2. Incorrect answers will be drawn from two categories of errors which might be made in solving the problems. These two categories are incorrectly translating a problem into a mathematical expression and computing inaccurately.

3. The error of incorrectly translating a problem into a mathematical expression may occur because either:

   a. The student does not determine the appropriate single arithmetic operation to use.

   b. The student does not understand terminology or abbreviations in the item.

   c. The student misinterprets the information displayed.

4. The error of computing inaccurately may occur because either:

   a. The student uses an incorrect measurement equivalent.

   b. The student makes one or more mistakes in calculation.

ANALYSIS OF SAMPLE TEST ITEM

A. Incorrect computation--multiplied without carrying.

B. Incorrect translation--misinterpretation of information displayed. Multiplied 27 x 10.

C. Correct answer.

D. Incorrect translation--misinterpretation of information displayed. Multiplied $8.75 x 27.

Instructional Suggestions

KEY SUBSKILLS

Comprehension of Terminology. Students must understand the vocabulary commonly occurring in documents and problems related to the types of activities eligible for testing. The Financial Terminology Supplement, for example, should be mastered.

Interpretation of Displays. Students must be able to read out information from the types of documents and diagrams eligible for display in test questions.

Knowledge of Measurement Units, Abbreviations, and Equivalents. Students must know the measurement units, abbreviations, and equivalents listed in the supplement.

Translation of Problems into Mathematical Expressions. Students must be able to identify all numerical quantities necessary to the solution of a problem and to determine the appropriate arithmetic operation to be performed with those quantities.

Mathematical Computation. Students must be able to perform the arithmetic operations of addition, subtraction, multiplication, and division with whole numbers, decimals, common fractions, mixed numbers, and percents. Students must also be able to reduce a common fraction to its lowest terms and to round off a decimal fraction or a monetary amount.

INSTRUCTIONAL CONSIDERATIONS

The ability to solve problems encompasses a very broad content area. Students can be helped most by acquiring the necessary subskills for this type of quantitative operation. The two most significant subskills

are (1) the ability to translate word problems into mathematical expressions and (2) the ability to perform basic computations. Computational skill will be mastered with much practice. The really pivotal subskill here is the ability to translate problems into mathematical expressions. This skill involves identifying all the numerical quantities necessary to the solution of a problem and determining the appropriate arithmetic operation to be performed with these quantities. The procedures or steps to be followed in solving problems could be modeled for students, followed by providing them with many opportunities to solve problems which involve single arithmetic operations. The skill of estimation could also be taught, as a means for both rejecting markedly incorrect answers and confirming correct solutions.

POSSIBLE TEACHING ACTIVITIES

Model Solvers. To supply less proficient students with exemplary problem solution strategies, the teacher should ask several of the more skilled students in a class to recount for the rest of the class how they approach a problem such as those to be encountered in this competency. The students who will be best at providing these models will be those who can introspect skillfully and verbalize their personal problem-solving approaches.

Classy Problems. Separate students into groups and have each group take responsibility for one of the four sets of activities, e.g., personal finances, cited in the competency description. A group is to collect materials related to its content area and create a number of problems using those materials. These problems are then presented to the entire class for solution and discussion.

Item File. Have students write single operation problems which are reviewed for quality by a special panel of student item-reviewers. These items can be placed on 5 x 8 inch file cards and entered into a class problem file. This file can be used both for practice and for class examinations.

Terminology Bee. Divide the class into two groups and have a Terminology Bee (the mathematical equivalent of a Spelling Bee). Questions come from the Measurement Units, Abbreviations, and Equivalents Supplement and the Financial Terminology Supplement supplied earlier. For instance, students are asked to supply the meanings for abbreviations. Or they must give the measurement equivalent for specified measurement units. The winning team is the one which makes the fewest errors.

Teams and Tournaments. Divide the class into five or six evenly matched teams. During one class period each team practices separately with a set of 3 x 5 cards containing sample problems. On the following day each member of a team competes against two other students, each representing a different team. A set of 3 x 5 cards with similar problems to those used the previous day is placed face down on the table in front of the group of three. The first player turns over the top card and reads it aloud. Each player works out an answer. The first player offers a solution. If the solution is correct, that player keeps the question card as a scoring token. If the solution is incorrect, the first opponent to challenge the answer and have the correct solution keeps the scoring token.